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EXAMINER

PADGETT, MARIANNE L

ART UNIT

PAPER NUMBER

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/566,334	<b>Applicant(s)</b> CHELLAPPA ET AL.	
	<b>Examiner</b> MARIANNE L. PADGETT	<b>Art Unit</b> 1715	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 6/24/10 & 10/7/10.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3,4,8-18,21-23,25-31,33-35,37,38,40-42 and 45-49 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,8,9,11-18,21-23,25-31,33-35,37,38 and 47-49 is/are rejected.
- 7) ☒ Claim(s) 10,40-42,45 and 46 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/24/10</u> .   | 6) <input type="checkbox"/> Other: _____                          |

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1. Applicants' **6/24/2010 amendment** to the **specification** corrects the problem noted in [0002] in section 1 of the action mailed 12/24/2009.

As discussed in the interview of June 23, 2010, the amendments, as submitted 10/7/10 to the claims provide corrections for many of the second paragraph rejections & objections as set forth in sections 1-2 of the action mailed 12/24/2009. For instance, in amended independent claim 1, the combined context of the polishing step creating the smooth surface & the bulk properties of the substrate remaining unchanged is considered to provide clear scope, especially in combination with applicant's discussion in their Remarks in the paragraph bridging pages 10-11 of the 6/24/10 response, from which the examiner understands that polishing is considered to encompass any technique that causes a decrease in the original roughness of the initial surface, such that the "polished" substrate surface is smoother than it was before the polishing treatment, but that the bulk characteristics of the substrate have not been effected, where the specifically listed techniques (shot-preening, metal deposition by plasma, CVD or PVD on porous surfaces) are considered to be to provide "polishing". The examiner notes that applicant cited in [0014], [0020] & [0063] of the specification as support & definition of polishing, and the examiner which is to point out that [0070] provides additional discussion thereof, as well as support for the new claim limitations with respect to bulk properties.

However, the examiner notes some additional problems in the claims, which were not noted by the examiner or applicant's representative during the interview, particularly note dependence problems.

The amendments to the claims have also added limitations from dependent claims to the independent claims, which limitations were not previously included in the **102(b)** rejections over **Ma et al.** (6,152,987), **OGAWA et al** (5,782,960), & **Oyama et al.** (6,527,833 B1), thus these rejections are overcome, however further obviousness considerations remain.

2. **Claims 10, 30-31, 45-46 & 40-42** are **objected** to under **37 CFR 1.75(c)**, as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is

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required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

**Claims 10, 45-46 & 40-42** are dependent from claims which have been canceled, i.e. canceled claims 6, 44 & 39, respectively, thus these claims can no longer be properly examined over the prior art due to lack of any clear relationship to any independent claims.

With respect to **claims 30 & 31**, which depend from independent claim 29, the independent claims was amended to require that "the substrate is a porous metal" (line 5), thus it is unclear how claims 30 & 31, which are directed to introducing these limitations, further limit the amended independent claim.

3. **Claims 1, 3-4, 8-18, 21-23, 25-31, 33-35, 37-38 & 47-49** are rejected under 35 U.S.C. **112, second** paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Upon review of the amended independent **claim 1** & its dependent claims, the examiner is unclear if the claimed language is requiring the composition to be deposited on the same surface that has had the surface treatment(s) performed thereon (i.e. polishing step & optionally subsequent barrier layer deposition), as the claims include the possibility of many surfaces, plus there are no temporal terminology or antecedents requiring the surface on which the composition is disposed to have been subjected to the polishing step, as order of listing steps is not required order of doing steps, on last the claim limitations require it. Note that since as in dependent claim 8, a barrier layer may be deposited on the treated surface, such that it is no longer necessarily the "at least one surface", the intended scope of these series of limitations with respect to exactly what the composition is disposed upon is unclear. If the "at least one surface" can be considered to be that which has the barrier layer deposited thereon, then it can also be considered to be the one that has the composition deposited thereon when polishing occurs, unless applicants provide claimed language that clearly necessitates a particular sequence of actions. For

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purposes of examination over the prior art, any of the possible processing & layer sequences may be considered, for the claims as written.

While the majority of the previous clarity issues were corrected some remain.

Use of **relative terms** that do not have clear metes and bounds in the claims, or in a definition in the description or in cited relevant prior art, is vague and indefinite. In the claims, see “**low**” in **claim 27**, which is describing “low partial pressure of oxygen”, but provides no metes and bounds to indicate what scope or range of pressures is being indicated by the adjective “low”. The examiner notes that [0062] discusses oxygen exposure & how thermal exposure & oxygen partial pressures relate to formation of PdO forms, plus discussing minimization of exposure to “low P<sub>O2</sub>”, but do not give a definition of “low partial pressure of oxygen” which may be said to provide any necessary definition to the claim terminology.

Also, the term “**diffusion barrier**” is a relative term, since what the barrier is preventing from diffusing or what is it a barrier to, has not been defined. Lacking a clear scope, “diffusion barrier” may also be considered a relative term, or very broad, since most solid layers will prevent something from diffusing through them. Particularly, see **claims 8-9& 33** that require this limitation.

In independent **claim 29**, line 5, discussing the substrate, introduces it as having “a surface thereof...” (emphasis added), but subsequent line 6 refers to “the at least one surface has moved....” (emphasis added), which lacks proper antecedent basis as it is a considerably different scope than the singular surface of the preceding line. Also note that it is not clear from the structure described whether or not the polished surface of the porous metal substrate is the same surface on which the coating is applied/resides, or if the polished surface and coated surface are different surfaces. Note claims 33-34 do not have the problem with respect to layer order, as it is specified therein with respect to a diffusion barrier.

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With respect to **claims 30 & 31**, which depend from independent claim 29, the independent claims was amended to require that "the substrate is a porous metal" (line 5), thus the use of articles "a" introducing "a porous substrate" & "a porous metal substrate" is confusing as it ambiguously implies a different substrate then was referred to in the amended independent claim.

4. The **disclosure is objected** to because of the following informalities:

In [0062], the term "6processing" is clearly a typographical error.

Proofreading for errors throughout the specification remains recommended

Appropriate correction is required.

5. As a matter of scope, it is noted that in **claim 34**, requiring etching of the "diffusion barrier" of unknown material & unknown microstructure, where what the barrier prevents diffusion of is also unknown, produces no necessary or determinable structure with respect to claimed product of a "hydrogen separation membrane"; i.e. it is a method limitation lacking any necessary structural effects & a product need not be shown to have had any etching performed on a layer in the correct position for the product to read on the current claims. Similarly, with respect to **claim 35**, the particular generic type of polishing operation performed, aside from the techniques explicitly requiring deposition of metal, provides no necessary structure beyond that already set forth in independent claim 29, as these are method options not providing specific structural effects beyond what was already claimed. Note analogous considerations would apply to claim 40 if it depended from independent claim 29.

6. The following is a quotation of **35 U.S.C. 103(a)** which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly

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owned at the time any inventions covered therein were made absent any evidence to the contrary.

Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The nonstatutory **double patenting rejection** is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. **Claims 1, 3-4, 8-9, (10), 11- 18, 21-23, 25-31, 33- 35, 37, (40-42, 45-46) & 47-49** are

**Claims 5-10 & 32-35** are rejected under 35 U.S.C. **103(a)** as being unpatentable over **Ma et al.** (6,152,987), in view of **Hu** (2001/0016236 A1) , and further in view of **Dye et al** (6,214,090 B1) or **Peachey et al.**(5,738,708), optionally combined with **Yoshida et al.** (EP 1 208 904 A1).

Applicants have amended (10/7/10) independent claim 1 to require limitations as previously set forth in dependent claims 2 +5+ 6+ (3 or 19 or 20 or 24), as well as additional limitations describing the effect of the required polishing to create smoothing of the original surface without changing the bulk properties of the substrate. Similarly, independent product claim 29 has been amended to require limitations previously set forth in now canceled dependent claims 32+36+39+ (43 or 44), however the

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limitations of these dependent claims were previously discussed, although not in combination with each other, which combination will be further discussed below with relevant previous rejections.

**Ma et al** teach forming a hydrogen gas-extraction module that is selectively permeable to hydrogen; where the substrate may be a porous metal (stainless steel) tube, that is initially cleaned (a surface treatment), however there is also a discussion that the substrate may be heated to cause easily diffused elements, such as Al that are present in taught substrate (e.g. steel alloys) to diffuse to the surface of the steel substrate, where it can then be oxidized to form a diffusion resistant aluminum oxide coating. Alternatively, a metal to be oxidize can be deposited on the porous substrate, where that metal may be deposited by any conventional method, where suitable metals that easily oxidized in air are taught to **include Ta, Nb, V, & Al** (col. 3, line 21-col. 4, line 24, esp. col. 4, lines 1-24). The examiner notes that these are also substrate surface pretreatments; although Ma et al.'s heat diffusion technique is precluded by applicants' amended claims, since it changes the bulk properties of the substrate by diffusing the metal from the interior of the substrate to the surface, the alternative option of metal deposition is entirely consistent with techniques that applicants' specification discloses as polishing, i.e. the deposition of metals, although Ma et al. does not specify plasma deposition, CVD or PVD on the porous surface as disclosed in applicants' specification as providing a polishing effect, but one of ordinary skill in the art would readily recognize that Ma et al.'s teachings of employing conventional metal deposition techniques would reasonably have been expected to include conventional PVD, CVD & plasma CVD, etc. techniques that are standardly employed for metal deposition, however these teachings in the primary reference are silent as to whether or not any smoothing effects would be present.. Further teachings with respect to all et al.'s intermediate coating techniques are found on col. 5, which will not be discussing the suggested "conventional methods" of metal deposition, discusses oxidation, nitration or carbide formation on the surface, as well as additional protective layers such as alumina, silica, zirconia, titania, tantalum oxide, tungsten oxide, etc., applied by a suitable method (col. 5, line 46-50).

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After such substrate preparation, **then** it is oxidized, nitrated or carbonized to form a barrier layer (intermediate layer 14, col. 3, line 46-col. 4, line 27). Thereafter, a membrane layer of Pd or Pd +Ag that may be 18-32  $\mu\text{m}$  thick, with preferred alloy ratios of 75-77% Pd and 23-25 % Ag, is deposited by the exemplary method of electroless plating, then the resultant membrane is typically rinsed in deionized water at 50-60°C (reads on the generic, unspecified "thermal treatment" that has no particular results). Membrane deposition by other techniques, such as vacuum sputtering or spray deposition, are also noted as useful. Another embodiment separately plates Pd, then Ag, followed by forming the alloy membrane thereof at 300-1000°C in inert or H<sub>2</sub> atmosphere, thus also involve subsequent thermal treatment, where the option of performing in inert atmosphere would have less than 10% by weight hydrogen as this amount includes zero (the H<sub>2</sub> atmosphere option does not provide a concentration, although it would've been obvious to one of ordinary skill in the art to optimize).

With respect to the product claims that require use of laser direct write or a metallic ink with metallic and carrier components, these are method limitations that do not provide any necessary structure to the product that is not already found in the structure of Ma et al's H-extraction modual, especially considering that the carrier in the ink, as read in light of the description is not intended to be a part of the resultant product. In Ma et al (987), see the abstract; figure 1; col. 1, lines 21-col. 7, line 40, esp. col. 1, lines 21-60; col. 2, lines 25-65; col. 5, lines 51-60+; and col. 7, lines 10-40.

While Ma et al. teaches various possible barrier layers on their substrate before deposition of their Pd or Pd+Ag layer, they do not discuss etching of the barrier layer before the Pd deposition. However, it is noted that applicant's barrier layer is of undefined material, and while it seems probable that its nonspecific diffusion barrier effects are intended to be analogous to those of Ma et al., the claimed etching of an unspecified material with specific agents, is fairly meaningless, especially when exactly what effect the etching is supposed to have on the unspecified materials is also absent. This aside, it may be observed, that after Ma et al. deposits an intermediate barrier layer from among their taught options

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(col. 5, lines 20-61), their exemplary Pd deposition sequence starts with immersing the substrate/intermediate layer in acidic  $\text{SnCl}_2$  (e.g. a pretreatment before the Pd deposition & post-treatment after barrier layer deposition). While the overall composition of the  $\text{SnCl}_2$  solution is not given, it would've been obvious to one of ordinary skill in the art to employ an aqueous solution of acidic  $\text{SnCl}_2$ , & in order for it to be acidic as taught when using  $\text{SnCl}_2$ , an obvious choice of acid would have included HCl, because of the ligands of the catalytic tin compound. Hence, the initial immersion treatment providing catalytic or seed layer before the additional deposition (e.g. the composition, a Pd compound exemplified by  $\text{PdCl}_2$ ) would reasonably have included HCl, such that this acidic solution would reasonably have been expected by one of ordinary skill to etch something on the substrate (e.g. etch the surface by cleaning or helping to produce active sites for the Sn catalyst, etc.).

**Ma et al** do not teach the use of a laser direct writing process, nor an ink composition, however they do teach that alternate membrane (Pd-Ag layer) deposition techniques may be used besides the exemplary electroless plating. **Hu** teaches a technique taught to be advantageous over electroless plating ([0009]), as well as to be useful for catalysis/separation applications or Pd-based membranes for H-permeability ([0010-11].), although does not provide a specific example of such use, but teach developing & implementing their techniques for specific embodiments would be a routine undertaking for those of ordinary skill in the art ([0018]). **Hu** teaches how to effect deposits having microporous, nanoporous or dense microstructures ([0026]). He The Hu technique may pretreat a substrate (possibly porous metal) with a photocatalyst coating to be coated with a metal layer ([0027]), **then** with a solution containing metal precursors, for metals inclusive of Pt, Pd,... Ag,... ([0024], [0031], etc.), in carrier liquids including organic solvents or biological materials ([0024], [0030], etc.); **after** which heat may be applied to evaporate liquid ([0025]), and light that may be from a position-controllable laser beam to cause reduction to metal, so is inclusive of **laser writing processes**. In [0025], Hu's teachings suggest multiple applications of the precursor suspension may be applied. The structure of the film will be selected

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according to end use and may be porous to dense depending on biological/organic components present, where **sintering** may be employed to remove organic or biological components ([0026]), thus suggesting further thermal treatment as claimed. The technique may be used to make film from 1-5000nm (i.e. .001-5 $\mu$ m). In **HU**, further see the abstract; [0005-7]; [0009-11]; [0016], [0018-19]; [0024-0026]; [0028-31]; and [0034-35].

It would have been obvious to one of ordinary skill in the art to apply the technique of **Hu** in the process of **Ma et al** for deposition of the Pd-Ag coating, because the primary reference suggests that alternate deposition techniques are applicable, where Hu provides motivation for use of the technique specifically due to their suggested enduses that explicitly include hydrogen separation membranes, such as Pd-based membranes as desired by Ma et al., plus Hu teaches that it is advantageous over electroless plating, which is the exemplary technique used by Ma et al., thus providing a reasonable expectation of superior results.

**Ma et al** do not teach a step that is a "polishing" step of an ion beam treatment or vapor deposition before depositing their metal chalcogenide (oxide barrier coat), but as noted above they do teach the option of conventional deposition of metal (e.g. Ta, Nb, V, Al, or other easily oxidized metals) in preparation for oxidizing the surface to form a metal oxide barrier layer, but without explicit mention of the deposition process employing vapor techniques or affecting surface smoothness. However, **Dye et al** or **Peachey et al**, who are also teaching formation of analogous membranes, teach ion milling as a cleaning that may be used in conjunction with washing pretreatment before coating the core substrate with a catalytic metal, such as Pt or Pd, etc, possibly by vapor deposition techniques, onto the metal core that is not porous, but passes hydrogen. Additionally, an intermediate buffer layer may be employed between the central metal & the catalytic metal, inclusive of metal oxide, such as alumina, tungsten oxide, or other oxide like silica, etc., so as to reduce interdiffusion between catalytic metal & central metal, where the buffer layers are also preferably deposited in the same manner as catalytic metal, i.e. under

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vacuum using vapor deposition techniques, where the teaching of the same manner which suggest inclusion of the same cleaning techniques. Either the ion milling or the vapor deposition metal step may read on the claimed 'polishing' due to expected effects and context, as well as what polishing encompasses in the scope of the claims as read in light of applicant specification. In DYE et al, see the abstract; col. 1, lines 10-17 and 36-col. 2, line 45; col. 3, line 11- col. 4, line 55. In PEACHEY et al, see the abstract; col. 2, line 36-col. 4, line 15, esp. col. 2, lines 51-57 & col. 3, lines 51-66.

It would have been obvious for one of ordinary skill in the art to apply metal layers to the porous cylindrical substrates of Ma et al., as suggested therein as preparation for formation of oxide barrier layers, by employing techniques as used by Dye et al or Peachey et al, because the ion treatment technique is a cleaning technique taught to be desirable combined with Ma et al's suggested cleaning; and furthermore is used preceding various taught vapor deposition coevaporation, ebeam evaporation, sputtering, ion beam assisted sputtering, etc.), which are demonstrated to be a conventional techniques for depositing metals (or metal oxides), such that it would have been reasonable for want of ordinary skill of the art to employ the additional cleaning techniques demonstrated for analogous purposes & analogous materials, as well as employing Dye et al or Peachey et al's suggested deposition techniques that would reasonably be considered to read on the suggested conventional deposition techniques of the primary reference, especially considering the desirability of employing both techniques together as preparation for the oxidation treatment of Ma et al due to their expected effectiveness so employed on about analogous substrates for analogous sequences of coating materials; noting both Ma et al. & Dye et al or Peachey et al are concerned with desirable for its effects as a catalytic metal, and for the overall composite with the barrier layer for effecting reducing poisoning of the membrane. It is further note that the ion beam milling is preformed in the same chamber as the vacuum depositions of catalytic and oxide layers that as its name suggest, it causes removal of surface material, i.e. etching, and is old and well known for a technique to improve adhesion, hence would have been analogously obvious used between coating steps

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for similar surface activation effects. Peachey et al is noted to further use ion-assisted vapor deposition techniques for both catalytic metal and oxide buffer layer, and it was known in the art that such techniques may employ an ion beam simultaneously with vapor deposition, which sputters or etches materials simultaneously with deposition.

It is further noted that while this combination does not use the term "polished", as discussed above, it would reasonably have been expected to provide the results which may be termed "polished" in light of applicant specification that indicate such metal vapor deposition techniques, as suggested by the above combination, would be considered to produce a smooth or polished affect on the surface, especially lacking any more detailed or specific requirements that provide any critical differences in the generic treatment technique that might possibly provide any differentiation.

Optionally, one of ordinary skill in the art would reasonably further consider the teachings of **Yoshida et al.** ((EP): abstract; [0001-2+]; [0006-17]), who are also forming hydrogen separation membranes employing porous substrates that may be metal, but included teachings with respect to the types of surface roughness desirable in the base material & teach steps of polishing the surface of the base material in order to provide desirable surface structure. Thus, it would've been obvious to one of ordinary skill in the art that given analogous structures & like enduses, to consider the teachings of desirable & effective relative roughnesses & polished surfaces of porous substrates, as discussed by Yoshida et al. & optimize the above combination in order to provide surfaces having desirable demonstrated & texture, noting that if the above combination already provides or has the capability of providing taught desirable surface textures, determining this would have been within reasonable bounds of optimization & routine experimentation.

8. **Claims 29-31, 33-35, 37-38, (40-42, 45-46) & 49** are rejected on the ground of nonstatutory **obviousness-type double patenting** as being unpatentable over claims 1-15 of U.S. Patent

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No. **7,560,170 B2** (Chellappa), in view of **Ma et al.** (6,152,987), and optionally further in view of **Hu** (2001/0016236 A1), both discussed above.

The copending **patent (170)** claims are directed to products inclusive of hydrogen separation membranes, which have the structure of a porous metal substrate, which has been treated to decrease its surfaces "initial variance", without substantially altering the bulk porosity of the metal substrate, which decrease of the initial variance is achieved via deposition of a coating. In order to form the hydrogen separation membranes a membrane material is deposited thereon which may be palladium. While the discussion of decreasing variance in copending (170) patent claims uses different semantics than the presently claimed "polishing" of the present application, both sets of claims are directed to smoothing surfaces microstructure, hence are considered to be directed to overlapping scopes that are obvious variations on the same concept.

The copending patent (170) claims also differ by not requiring particular structures, such as the substrate being cylindrically shaped, or employing a diffusion barrier, and do not discuss particular thicknesses for their membrane, as well as not reciting the same method limitations in the product claim as the present application, however as can be seen from the teachings of **Ma et al.**, hydrogen separation membranes conventionally employ cylindrical shapes & layers to prevent diffusion from the substrate to the catalytic membrane, which read on the presently claimed diffusion barrier, as well as employing thicknesses overlapping with those presently claimed, thus it would've been obvious to one of ordinary skill in the art to employ the teachings of Ma et al. when determining overall structures useful for employing the specific product features of the (170) claims, as Ma et al. demonstrates the conventionality of such structures for the same enduses. With respect to the claimed method limitations in the product claims, they do not define any necessary structural difference from the structure suggested by the combination of Ma et al. & the (170) claims, or optionally, the teachings of **Hu**, as discussed above in combination with Ma et al. in section 7, demonstrate the obviousness of techniques such as laser writing

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using metallic solutions that may be called metallic inks, for deposition like metal coatings that may also be employed for hydrogen separation membranes, thus further showing the obviousness of the structure, as well as the capability of depositing that structure via the particular techniques.

9. **Claims 1, 3-4, 8-9, (10) 11-18, 21-23, 25--31, 33-35, 37-38, (40-42, 45-46) & 49** are rejected on the ground of nonstatutory **obviousness-type double patenting** as being unpatentable over claims 1- 27 of U.S. Patent No. **7,077,889 B2** (Chellappa et al.), in view of **Ma et al.** (6,152,987), and further in view of **Hu** (2001/0016236 A1).

The copending **patent (889)** claims are directed to products & processes for forming hydrogen separation membranes, which have the structure of a porous metal substrate, which has been treated on the surface by ion beam exposure to decrease its surfaces initial "variance", where a membrane containing lease some palladium is deposited on this treated printable surface. While the discussion of decreasing variance in copending (889) patent claims uses different semantics than the presently claimed "polishing" of the present application, both sets of claims are directed to smoothing surfaces microstructure, hence are considered to be directed to overlapping scopes that are obvious variations on the same concept.

The copending patent (889) claims also differ by not requiring particular structures, such as the substrate being cylindrically shaped, or employing a diffusion barrier, and do not discuss particular thicknesses for their membrane, as well as not reciting the same method limitations in the product claim as the present application, nor do the method claims of (889) required the presently claimed laser direct writing process & the composition deposited for this treatment, however as can be seen from the teachings of **Ma et al.**, hydrogen separation membranes conventionally employ cylindrical shapes & layers to prevent diffusion from the substrate to the catalytic membrane, which read on the presently claimed diffusion barrier, as well as employing thicknesses overlapping with those presently claimed, thus it would've been obvious to one of ordinary skill in the art to employ the teachings of Ma et al. when

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determining overall structures useful for employing the specific product features of the (889) claims, as Ma et al. demonstrates the conventionality of such structures for the same enduses. With respect to the claimed method limitations in the product claims, they do not define any necessary structural difference from the structure suggested by the combination of Ma et al. & the (889) claims. Alternatively, the obviousness of the (889) products may be further considered, along with the obviousness of particular palladium membrane deposition techniques, when considering the teachings of **Hu**, as discussed above in combination with Ma et al., as set forth in section 7, which demonstrate the obviousness of techniques such as laser writing using metallic solutions that may be called metallic inks, for deposition like metal coatings that may also be employed for hydrogen separation membranes, thus further showing the obviousness of the structure, as well as the capability of depositing that structure via the particular techniques.

**Claims 1, 3-4, 8-9, (10) 11-18, 21-23, 25--31, 33-35, 37-38, (40-42, 45-46) & 49** are rejected under 35 U.S.C. **103(a)** as being obvious over **Chellappa et al.** (7,077,889 B2), in view of **Ma et al.** (6,152,987), and further in view of **Hu** (2001/0016236 A1), the combination discussed immediately above with respect to the claims.

The applied reference has a **common inventor** (Anand Chellappa) with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104,

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together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

See above discussion with respect to the claims, which as part of the patent are also relevant to this rejection & note that the filing date of this patent predates the provisional filing date of the current application. Furthermore in the specification note the figures illustrating a fax of ion bombardment, as well as relevant discussion on col. 4, lines 22-37; col. 5, lines 11-67+, esp. lines 54-60; col. 6, lines 18-29 discussing employing commonly used deposition techniques of electroless plating or electroplating, which is analogous to Ma et al., all of which further support the above discussion of obviousness.

10. With respect to the 6/24/2010 IDS, it is noted that **Dye et al.** (WO 00/78434 A1) is the child of **Dye et al.** (090) applied above; while the Japanese abstract of Shigamura et al. indicates use of laser heating, but to plasma sprayed, not solution or ink applied material.

Also of interest to the state-of-the-art is **Chellappa** (7,220,699 B2) by one of the present inventors & directed to overlapping subject material, but overall different methods & products.

**Other art of interest previously cited** included: **BOSSARD et al** (2004/0244589 A1), while published on 09/12/04 is noted to have a provisional parent with filing date of 6/4/2003, so as a potential 103(e) reference, especially relevant to claims 1, 3 and 5, 7, 13-18, 29-31, 36-47 & 49, but is presently redundant in view of the above rejections. Particularly, see the abstract; figures, esp. 5-9; [0018-19]; [0041-51]; [0060-71], esp. [0063], [0066], [0068].

**ALLEN et al** (6,077,621) is noted to have teaching is equivalent to dye et al. & peachy et al., as discussed above in section 8. Particularly, see the abstract; col. 1, lines 10-20; col. 3-5.

11. Applicant's arguments filed 10/7/10 & 6/24/10, discussed above have been fully considered but they are not persuasive.

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The examiner notes that as read in light of applicant specification, it is not necessary for the examiner to demonstrate any of the relative descriptions of "shiny metal or very smooth or planarize surface" as appears to be suggested as necessary by applicant on page 13 of their arguments.

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

13. **Any inquiry** concerning this communication or earlier communications from the examiner should be directed to **Marianne L. Padgett** whose telephone number is **(571) 272-1425**. The examiner can normally be reached on M-F from about 9:00 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks, can be reached at (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair->

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/Marianne L. Padgett/  
Primary Examiner, Art Unit 1715

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